SPERM SELECTION BY MOLECULAR PROFILING

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In spite of the achievements and development of the assisted reproduction techniques (ARTs) in the last years, there is still an elevated percentage of unsuccessful treatments, needing sometimes repeated attempts to reach pregnancy.

The responsibility of reproductive success is shared between the male and the female gamete. Regarding oocytes and mainly due to their low number, it becomes difficult to analyze them, and frequently (if the legal environment allows it) all of them are selected to be fertilized.

A greatly different scenario is found among spermatozoa where usually several millions are present in the ejaculate, each one presenting different molecular characteristics due to the meiosis process and genetic recombination during spermatogenesis, although only one is needed to achieve fertilization, adequate embryo development, implantation, normal foetal development, and live birth. Moreover, obtaining a semen sample is usually much easier than obtaining a cohort of oocytes.

Different sperm preparation and selection techniques are used in ARTs. The main objective of these techniques is the collection of a sufficient number of viable and motile sperm capable of fertilizing the oocyte(s) to subsequently sustain correct embryo development and the achievement of a live-birth.

Standard sperm preparation techniques currently employ either swim-up or density gradient centrifugation, which are based on a sedimentation or migration procedures.

Nevertheless, these systems do not select sperm by their molecular features but only by motility characteristics, although several studies have demonstrated the relevance of certain molecular features of the spermatozoa conditioning reproductive success.

Although apoptosis is one of the most studied processes in this sense, although the relevance of other, such as ubiquitin, hyaluronic acid receptors, and all the molecules that have been found differentially expressed in spermatozoa from which pregnancy have been achieved vs. those who not, by microarray analysis may also be candidates to select those spermatozoa with the optimal molecular profile to succeed.

Magnetic activated cell sorting (MACS) technology enables cell separation depending on molecular features, after tagging desired or undesired cells with a high specificity by means of molecules or antibodies recognizing membrane epitopes, linked to magnetic microspheres, that being passed through a filter under a magnetic field, can be either recovered to be employed or discarded to purify the main fraction, depending on their desired or undesired molecular profiles.

The available information about the use of this technology to improve assisted reproduction via molecular sperm selection is scarce. In our lecture, we will initially present all the rationale and scientific background to select those molecules candidates to be employed in sperm selection for ART, as well as the clinical results obtained to date after the use of this technology to eliminate apoptotic sperm cells, and the description of a multicentric program for sperm selection, in order to test the benefits of MACS selection of spermatozoa for assisted reproduction.